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09/098,730	06/18/1998	TOMIO SUGIYAMA	PM-254782	4440

7590 12/04/2001

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EXAMINER

TUNG, TA HSUNG

ART UNIT	PAPER NUMBER
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1743

DATE MAILED: 12/04/2001

29

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UNITED STATES DEPARTMENT OF COMMERCE
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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Paper 29

Serial Number: 09/098,730
Filing Date: June 18, 1998
Appellant(s): Tomio Sugiyama et al.

Kenneth M Fagin
for Appellant

EXAMINER'S ANSWER

MAILED

DEC 04 2001

GROUP 1700

This is in response to Appellant's brief on appeal filed
October 23, 2001.

(1) *Real Party in Interest.*

Appellant has stated that the real party in interest is
DENSO CORPORATION, the assignee of record.

(2) *Related Appeals and Interferences.*

Appellant has stated that there is no related appeal.

(3) *Status of claims.*

This appeal involves claims 1, 2, 4, 6, 7, 10, 11 and 18-22.

(4) *Status of Amendments After Final.*

The amendment after final rejection filed on August 29, 2001
has been entered.

(5) *Summary of invention.*

The summary of invention contained in the brief is correct.

(6) *Issues.*

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The Appellant's statement of the issues in the brief is correct.

(7) *Grouping of claims.*

Appellant states that all claims should stand or fall together.

(8) *Claims appealed.*

A correct copy of the claims on appeal is contained in the Appendix to the brief.

(9) *Prior Art of record.*

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

4,177,112	Suzuki etal (Suzuki)	12-79
4,861,456	Mase etal (Mase)	8-89

(10) *New prior art.*

No new prior art has been applied in this Examiner's Answer.

(11) *Grounds of rejection.*

The following ground(s) of rejection are applicable to the appealed claims.

Claims 1, 2, 4, 6, 7, 10, 11 and 18-22 stand rejected under 35 USC 103(a) as being unpatentable over Mase in view of Suzuki.

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Mase discloses an alumina layer 54 sandwiched by an insulating layer 50 and an electrolyte layer 28, an alumina layer 34 sandwiched by electrolyte layers 28 and 8, and an alumina layer 20 sandwiched by electrolyte layers 8 and 10. The alumina layers are porous for the purpose of minimizing stress due to difference in coefficients of thermal expansion. Thus, the alumina layers correspond to appellant's ~~boundary layer~~. See col. 6, line 50 to col. 8, line 38 of Mase.

Appellant's claim 1 differs from Mase by calling for the boundary layer to have an average sintered particle size larger than the average sintered particle size of the electrolyte layer and the insulating layer.

Suzuki discloses forming a more porous layer 4' with larger particles than a neighboring layer 4. See col. 2, lines 38-49 of the patent.

It would have been obvious for Mase, in view of Suzuki, to employ particles in the alumina boundary layer larger than the particles of its neighboring solid electrolyte layer and insulating layer so as to obtain a boundary layer more porous than its neighboring layers. Using larger particles would be an efficient, easy way to ensure a higher porosity for the boundary layer, and make it unnecessary for additional treatment to achieve the desired higher porosity.

Response to arguments.

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Appellant argues that Mase does not disclose what the examiner asserts it discloses. That is, the examiner's reasoning for modifying Mase by using larger particles for the boundary layer than its neighboring layers based on the teaching of Suzuki makes sense only if Mase discloses the boundary layer to be more porous than its neighboring layers. Since Mase merely states that the boundary layer should be porous, but does not state that the boundary layer should be more porous than its neighboring layers, there would be no motivation to use larger particles for the boundary layer to make it more porous than its neighboring layers.

This argument is not persuasive. It is common knowledge that a solid electrolyte layer is non-porous. Otherwise, a measurement gas and a reference gas on opposite sides of the electrolyte layer would intermingle and defeat the operational principle of the sensor. Note that in figures 5 and 7 of Mase, a measurement gas passes into contact with measuring electrode 58 on one side of solid electrolyte layer 56, while a reference gas passes into contact with reference electrode 64 on the opposite side of the solid electrolyte. See col. 8, line 42 to col. 10, line 4 of the patent. Similarly, an insulating layer, such as layer 50 of Mase, should be non-porous so as to avoid the possibility of current leakage. In fact, Mase confirms that

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insulating layer 50 is gastight (see col. 8, lines 1-3). Therefore, the porous boundary layers 20, 34 of Mase are more porous than the non-porous neighboring layers 10, 28 and 50.

Appellant also argues that porosity is not necessarily directly related to average sintered particle size. Thus, the examiner has failed to establish a prima facie case that it would have been obvious to use larger particle size to achieve higher porosity. And, even if prima facie obviousness has been established, appellant has overcome that obviousness with the publication of Sumitomo and the publication of Sumicorundum.

This argument is also not persuasive. Suzuki clearly establishes it to be prima facie obvious to employ larger particle size for higher porosity. Also, it would be common sense that spaces between larger particles would be larger than spaces between smaller particles. The Sumitomo and Sumicorundum publications not only do not overcome this prima facie obviousness but are actually considered to support the examiner's position.

Taking Sumitomo first, the Board's attention is directed to samples AKP-20, AKP-30 and AKP-50. If the average particle size from the table listing these samples is presumed to be about the middle of the particle size distribution range, it is clear from the graph titled ❖Effect of Firing Temperature on Fired Density❖ that all three samples follow the hypothesis that larger particle

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size yields higher porosity (higher density equates to lower porosity). Incidentally, the designation of AKP-53 in this graph is presumed to be a typographical error and should actually represent sample AKP-50 of the table. That this is the case is clear because AKP-50 is not shown in the graph. Also, note that all samples in the table have numbers ending in zero or half way between zeros. The number ~~53~~ does not follow this pattern.

The only sample that does not appear to follow the hypothesis that larger grain size means higher porosity is AKP-3000, which has an average particle size slightly under that of sample AKP-20 but has a higher porosity. Appellant relies heavily upon this deviation from the hypothesis as evidence to support his position that there is no predictability between particle size and porosity. The examiner believes that this deviation can be explained by the difference in the grain size distribution ranges. Note that AKP-3000 has a wider range (0.4-0.7) than AKP-20 (0.4-0.6). As discussed in Sumicorundum (see the penultimate paragraph on page 1 of the translation), a ~~sharp~~ particle size distribution ~~(narrow range)~~ yields higher densification (lower porosity). This would also conform to the common sense notion that there would be more space between particles of differing sizes than particles of similar sizes. From the Sumitomo and Sumicorundum publications, one of ordinary skill in the art would draw the conclusion that porosity is

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directly related to particle size as well as particle size distribution range.

Appellant takes the position that Sumicorundum stands for the proposition that particle size distribution range, rather than particle size, controls porosity, as evidenced by the fact that Sumicorundum obtained a higher density (lower porosity) product with larger particle size than the AKP samples of Sumitomo (see the top of page 2 of the Sumicorundum translation). Therefore, there is no direct relationship between particle size and porosity.

This position is not believed to be well-taken. As discussed previously, the sum of all the evidence (Suzuki, Sumitomo and Sumicorundum) in the record would suggest that porosity is directed related to particle size as well as particle size distribution range. Higher porosity is obtained from larger particle size and wider particle size distribution range. Appellant's claims are devoid of any limitation on the particle size distribution range. Thus, the claims must be considered on the basis that the particle size distribution ranges for all layers are the same. Particle size distribution range not being a factor, it is clear then that larger particle size would achieve higher porosity.

Appellant makes the further argument that Suzuki forms the layers 4 and 4' by plasma injection-welding in contrast to

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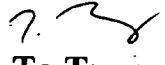
appellant's sintered layers. Thus, Suzuki does not disclose any relationship between porosity and sintered particle size.

This argument is further not persuasive. Appellant's claims are drawn to a product, not a method of making the product. Therefore, the method of making the product is irrelevant. Also, there is no evidence whatsoever that the relationship between porosity and particle size would be any different if the product is formed by sintering rather than injection-welding.

In summary, the preponderance of evidence in the record, including those submitted by appellant himself, supports the examiner's position that larger particle size is directly related to higher porosity. The one, single contradiction (sample AKP-3000 of Sumitomo) is explainable by a larger particle size distribution range.

For the above reasons, it is submitted that the rejection applied against the appealed claims should be sustained by the Board of Appeals.

Respectfully submitted,


Ta Tung
Primary Examiner
Art Unit 1743


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November 30, 2001

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